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STUDY OF SEASONAL VARIATION AND WATER QUALITY OF RIVER BINDUSARA IN BEED DISTRICT (MAHARASHTRA), INDIA

Zoology

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ABSTRACT

Growing populations may put stresses on natural waters both the quality of the water and hydrological budget. River Bindusara is the main river of Beed district Potable quality of river water is affected by seasons and other factors. Assessments of physico-chemical parameters were carried out during July 2021 to June 2022 in the two study sites namely Pali basin and Beed basin of River Bindusara. Eighteen (18) different water quality parameters were measured in all collected samples, including Water Colour, Air Temperature, Water Temperature, pH, DO, FCO2, Conductivity, Total alkalinity, Turbidity, total hardness,TDS, Calcium, Magnesium, Sulphate, Chloride, Iron, Sodium . The results that are recorded in the different stations are compared with the World Health Organization (WHO) [1] and it was found that the water of River Bindusara may be suitable for drinking and domestic purposes because all the values are between WHO ; except the values of Iron.

KEYWORDS

Seasonal Variations, River Bindusara, Physico-chemical parameters, Water, WHO.

I. INTRODUCTION

Water is the most vital resources for all kinds of life on this planet. Water is one of the nature's most important gifts to mankind. It is essential and most precious commodity for life. Rivers are vital and vulnerable freshwater systems and are essential for the sustenance of all life. Rivers provides main water resources for domestic, industrial and agricultural purposes [4]. The modern civilization, urbanization and prolonged discharge of industrial effluents, domestic sewage and solid waste dump cause the water to became polluted. Wild and domestic animals using same drinking water can also contaminate the water through direct defection and urination [2]. Variation in the quality and quantity of river is widely studied by the many researcher; Riedel et al. [5] examined the spatial-temporal variation in trace elements in Patuxent River, Maryland while Sileika, et al., [6] reported the variations in nutrient level in the Nemunas river of Russia. Schaefer and Alber [7] studied nitrogen and phosphorous in Altamaha river, Georgia. Singh, et al., [8] studied Physico-chemical properties of water samples from Manipur River System, India. Khatoon, et al., in [9] analyzed seasonal variation in the water quality among different Western Ghats of river Godavari, Krishna India.

The present study is an attempt to characterize the trends in physico-chemical properties of water quality of River Bindusara in Beed District, India and compare the results with WHO standards.

II. MATERIAL AND METHODS

Study Site

The riverBindusara (also called Bindusara) is a small river situated in the Balaghat Range, (44 km) district of Beed in Maharashtra state of India. It is a tributary river of Sindphana and a sub-tributary of Godavari river.Bindusara originates in the hills of Balaghat near the village Waghira, in south of district Beed in Patodataluqa. It is a hilly area. Various small streams contribute to the river. The city of Beed is situated on the banks of BindusaraRiver. In the present study, water quality of River Bindusara is reported from two different portion of the river namely Pali Village and basin near Beed city. The selection of the location is based the upstream, mid-stream and downstream of the River Bindusara. The samples were collected from Two different sites during Monsoon, Post-Monsoon, winter and Pre-Monsoon for the period since July 2021 to June 2022.

Water was collected and stored in clean polyethylene bottles that have been pre washed with deionized water. Water colour, air temperature, water temperature and pH were determined in the field because of their unstable nature. Water temperature and air temperature were measured with the help of mercury thermometer and pH was measured with pen type pH meter in the field and other parameters was analyzed in the laboratory using standard procedure of APHA [10] and using Perkin Elmer Atomic Absorption Spectrophotometer (APHA

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The present study of physico-chemical parameters of the River Bindusara revealed the below mentioned parameters and the parameters are discussed in the below:

1. Water Colour: Colour change is not harmful unless it is associated with a toxic chemical but it may be affect the quality of sunlight that penetrates to a given depth inhibiting plant and animal metabolism. The colour of water colour was clear in most of the study sites but the colour is pale green in the mid-stream of the river.

2. Air Temperature: The value of air temperature is highest in summer season in the Beed basin, 35 degree Celsius and minimum in the winter season in Pali basin 21 degree Celsius.

3. Water Temperature: The value of water temperature is highest in Beed Basin (summer) 30 degree Celsius and minimum in Pali basin (winter) 15 degree Celsius.

4. pH: The pH of a water body is very important in determination of water quality since it affects other chemical reactions such as solubility and metal toxicity, [11]. During the present study the value of pH is found normal in every portion of the river; the total ranges of value is lies between 6 to 8. The highest value of pH was recorded as 7.91 in Post-Monsoon season at Pali basin and the minimum recoded as 6.5 in winter season at Beed basin.

5. Dissolved Oxygen: Dissolved Oxygen (DO) is an important limnological parameter indicating level of water quality and organic pollution in the water body, [12]. The value of DO is remarkably significant in determining the water quality criteria of an aquatic system, [9]. In the system where the rates respiration and organic decomposition are high, the DO values usually remain lower than those of the system, where the rate of photosynthesis is high, [3]. The maximum value of DO is recorded as 8.8 mg/L in summer at Pali Basin and minimum recorded in minimum recorded as 4.9 in Pre-Monsoon at Beed basin. The maximum DO value in Monsoon (summer) is due to bright sunlight as it influences the % of soluble gases. The long day period of high intensity of sunlight accelerated photosynthesis which resulted to increase DO in summer, [13].

6. Free Carbon-di-oxide: Free carbon-di-oxide (Free CO2) dissolves in water varying amounts and the dissolution depends on partial pressure and temperature. FCO2 plays an important role in water bodies by producing calcium bicarbonate from calcium carbonate and this gas alters the pH of water by reacting with it to form carbonic acid. It is the basic raw material of photosynthesis in aquatic ecosystems[14]. At low dissolved oxygen concentration, presence of high FCO2 hinders oxygen uptake. The value of FCO2 ranges between 3.4 to 7.1 mg/L. The value was minimum in winter at Pali basin while it was recorded as high also in Beed basin in post-monsoon season.

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...electric current. Conductivity of water varies directly with the temperature and it is proportional to its dissolved mineral matter content. The value of conductivity ranges between 7-14 ppm. The value highest at Beed basin and the lowest value inPali basin.

8. Total Alkalinity: The value of total alkalinity (TA) provides idea of natural salts present in water, Gawas et al., 2006. Natural waters with high alkalinity are generally rich in phytoplankton, especially the blue greens. It is an important factor for productivity of an aquatic ecosystem. Total alkalinity of water is mainly caused by the cationsCa, Mg, Na, K, NH4 and Fe in combination with either CO32- or HCO3- or occasionally as OH-. Total alkalinity of water is due presence of mineral salts in it [14]. It is primarily caused by the carbonate and bicarbonate ions [8], [9].

9. Turbidity: Turbidity is the material in water that affects the transparency or light scattering of the water. The observed values of the turbidity were within the limit range of WHO standards. The minimum values were recorded at Beed basin as 78.1 and maximum values were recorded at Pali basin as 99.9. The both minimum and maximum values were recorded in in pre-monsoon season.

10. Total Hardness: Hardness is the property of water which prevents the lather formation with soap and increases the boiling point of the waters. The major cations imparting hardness are calcium and magnesium. Therefore, the total hardness of water is defined as the summary concentration of calcium and magnesium cations. The anions responsible for hardness are bicarbonate, carbonate, Sulphate and chlorides. Hardness is temporary if it is associated mainly with carbonates and bicarbonates. The value of total hardness is maximum in winter recorded as 88.5 mg/L at Beed basin and minimum in pre-monsoon recorded as 64.7 atPali basin.

12. Total Dissolved Solids: The quality of the Total Dissolved Solids (TDS) is in general proportional to the degree of pollution. TDS of the water sample varied from 4 ppm to 9 ppm which is below the permissible limits of WHO standards. The maximum value at Pali basin and the minimum value were recorded at Beed basin. The value of TDS is higher in Monsoon seasons than that of winter and other seasons. TDS can be influenced by changes in pH. Changes in the pH will cause some of the solutes to precipitate or will affect the solubility of the suspended matter [15].

13. Calcium: Calcium is an important micronutrient in an aquatic environment and this environment is affected by adsorption of calcium ion on the metallic oxides. In addition to this it has effect of microorganisms, which play an important role in calcium exchange between sediments and overlaying water [16]. The value of Calcium is ranges between 51.0 to 70.1 mg/L. The lowest value is recorded at Beed basin in monsoon season and the high value is recorded at Pali basin in winter season. The both minimum and maximum permissible values are in the WHO standards.

14. Magnesium: Magnesium is essential for chlorophyll and acts as a limiting factor for the growth of phytoplankton. Therefore depletion of magnesium reduces the phytoplankton population. Magnesium is required as an essential nutrient for aquatic plants [17]. Concentration of magnesium up-to 30ppm is recommended for drinking waters [14]. The value of Magnesium is ranges between 8.9 to 18.15 mg/L. The lowest value is recorded at Beed basin in monsoon season and the high value is recorded at Pali basin in pre-monsoon season. The both minimum and maximum permissible values are in the WHO standards.

15. Sulphate: The value of Sulphate ranges between 1.02 to 7.85 mg/L. The lowest value is recorded at Pali basin in post- monsoon season and the high value is recorded at Beed basin in pre-monsoon season. The both minimum and maximum permissible values are in the WHO standards.

16. Chloride: The origin of chloride is mostly from weathering of rocks but pollution can contribute locally. As chlorine is the main source of chloride, so by measuring the chloride one can easily identify the pollute water. The value of Chloride is ranges between 2.12 to 12.50 mg/L. The lowest value is recorded at Beed basin in monsoon season and the high value is recorded at Pali basin in winter season. The both minimum and maximum permissible values are in the WHO standards.

lowest value is recorded at Beed basin in pre-monsoon season and the high value is recorded at Pali basin in monsoon season. The both minimum and maximum values are cross the limits of WHO standards.

18. Sodium: The value of Sodium is ranges between 1.23 to 6.78 mg/L. The lowest value is recorded at Beed basin in winter season and the high value is recorded at Plai basin in pre-monsoon season. The both minimum and maximum permissible values are in the WHO standards.

IV. CONCLUSION

Physico-chemical characteristics of surface water varied according to seasons. Most of the water parameters vary seasonally. The results showed that mid-stream and downstream of the River Bindusara i.e. Beed basin are more polluted than that of upstream and downstream because of the sewage and wastage that comes from the Beed town. There is no significance chance in the pH value during the observation period. There were significant occurrence in Conductivity, TDS and TSS which call for caution on discharge untreated waste into River Bindusara. The study reveals that the water of River Bindusara shows seasonal variations in Calcium, Magnesium and Total Hardness which may be attributed to the local climatic conditions and water exchange mechanism. Concentrations of nutrients and like nitrite, phosphates etc. are within permissible limits. The physico-chemical characteristic of River Bindusara in the study area suggested that here was no harmful chemical contamination. If proper measures are taken for the treatment of sewage before discharge and restrictions are out on various anthropogenic activities upstream, the estuary would remain healthy in the long run.

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